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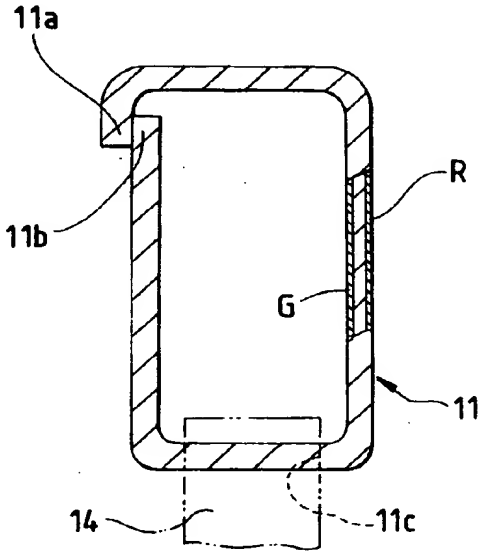
(54) Heat exchanger tank

(57) A hollow tank body portion (11) is formed by folding a plate of aluminium clad with a brazing filler metal layer (R). One end of the plate material (11a) extends over the other end (11b) and the thus overlapped ends (11a, 11b) are brazed together. Preferably these overlapped portions (11a, 11b) provide a locating portion for a mounting bracket (25 Fig 6) to hold it in place as it is brazed.

FIG. 1



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Description

The present invention relates to a heat exchanger tank which is a constituent element of a heat exchanger such as a radiator, an intercooler, or a heater core.

A heat exchanger such as that disclosed in; e.g., Japanese Utility Model Publication No. Hei. 3-31068, is known as a conventional heat exchanger such as a radiator or an intercooler.

Fig. 9 shows a heat exchanger described in the foregoing patent application. In this heat exchanger, a tank body 1 is formed by extrusion of aluminum, and tube holes la are formed in the surface of the tank body 1 facing a core 2.

The core 2 is formed by alternately stacking tubes 3 and corrugated fins 4 on over the other. A plate material 5 which is formed from aluminum clad with a brazing filler metal layer on both surfaces is attached to each side of the core 2.

The end of each of the tubes 3 is inserted into the corresponding tube hole la of the tank body 1. The tank body 1 and the core 2 are subjected to heat treatment in a brazing furnace while they are temporarily assembled together. The brazing filler metal layer of the plate material 5 is fused, to thereby braze the tube 3 to the tube holes la of the tank body 1.

On the other hand, a heat exchanger tank such as that disclosed in; e.g., Japanese Patent Publication No. Hei. 2-25693, is known as a conventional heat exchanger tank comprising a tank body to which a mount member is brazed.

Fig. 10 shows the heat exchanger of this type devised prior to the filing of the present patent application. In this heat exchanger tank, a tank body 6 is formed so as to have a rectangular cross-section by extrusion of aluminum.

A body 7a of a mount bracket 7 which is formed from aluminum clad is brazed to a mount surface 6a of the tank body 6, and the surface of the mount bracket 7 facing the tank body 6 is covered with a brazing filler metal layer. A leg 7b of the mount bracket 7 is brazed to a surface 6b adjacent to the mount surface 6a of the tank body 6.

A protuberance 7c protrudes from the mount bracket 7.

Fig. 11 shows the principal portion of the structure for mounting the foregoing heat exchanger tank to the vehicle body. The protuberance 7c of the mount bracket 7 is inserted into and supported by a through hole 9a formed in one side of a vehicle mount bracket 9 via a mount rubber 8.

The other side of the vehicle mount bracket 9 is fixed on an upper rail L of the vehicle body through use of a bolt B.

In the conventional heat exchanger shown in Fig. 9, the tank body 1 is formed by extrusion of aluminum. To thoroughly braze the end of the tube 3 to the tube hole 1a of the tank body 1, the plate material 5 which is formed from aluminum clad with a brazing filler metal layer is interposed between the tank body 1 and the core 2. Brazing metal fused from the brazing filler metal layer of the plate material 5 must be supplied to the tube holes la, thereby resulting in complicated structure of the core 2 and an increase in manufacturing cost.

More specifically, in a case where the tank body 1 is formed by extrusion of aluminum, it is very difficult to form a brazing filler metal layer on the tank body 1. For this reason, as shown in Fig. 9, there is a need for the plate material 5 which is formed from aluminum clad with a brazing filler metal layer is separately used in order to ensure brazing filler metal.

Further, in the heat exchanger tank shown in Fig. 10, the body 7a of the mount bracket 7 is raised from the mount surface 6a of the tank body 6 when the mount bracket 7 is brazed to the tank body 1, thereby resulting in brazing failures.

To prevent the brazing failures, the body 7a of the mount bracket 7 is temporarily fixed to the mount surface 6a of the tank body 6 by spot-welding S or point-welding prior to brazing the body 6a, which requires a large number of welding operations.

According to a first aspect of this invention a heat exchanger tank comprises:

a hollow tank body portion formed by folding a plate made of aluminium clad material having a brazing filler metal layer, and wherein a first end of the plate material extends along and is brazed to a second end of the plate material.

Preferably, the tank body portion is rectangular in cross-section and the first end and the second end of the plate material are overlapped and brazed to each other along an angular portion of the rectangular cross section. In this case a hole used for mounting an inlet or outlet pipe to the heat exchanger is formed in a surface opposite to a surface in which the first end of the plate material is brazed.

Preferably the heat exchanger tank also includes a mount bracket including a main body brazed to a mount surface of the tank portion and a leg brazed to a surface adjacent the mounting surface; wherein overlapped first and second ends are sandwiched between the main body and the leg of the mount bracket.

In accordance with a second aspect of the present invention, there is provided a heat exchanger tank comprising: a tank body formed by folding a plate material so as to have a reclangular cross section, a first end of the plate material extending along an outer side of an adjacent surface of the tank body; and a mount bracket including a main body brazed to a mount surface of adjacent to the adjacent surface of the tank body and a leg brazed to the adjacent surface; wherein the first end extended along the outer side of the adjacent surface is sandwiched between the main body and the leg of the mount bracket.

This arrangement provides a heat exchanger tank capable of ensuring temporary fixing of a mount bracket

to a tank body in a ready manner. The body and the leg of the mount bracket are preferably brazed to the tank body portion by means of a brazing filler metal layer of the plate material.

Preferably the side of the plate material which serves as the outer surface of the tank body is coated with a brazing filler metal layer.

Preferred embodiments in accordance with this invention will now be described with reference to the accompanying drawings; in which:-

Figure 1 is a cross-sectional view showing a heat exchanger tank in accordance with a first embodiment of the present invention;
Figure 2 is an exploded perspective view showing the heat exchanger tank shown in Figure 1;
Figure 3 is an explanatory view showing a method for forming a tank body of the heat exchanger tank shown in Figure 1;
Figure 4 is a perspective view showing a state in which the heat exchanger tank shown in Figure 1 is temporarily attached to a core;
Fig. 5 is a a cross-sectional view showing a heat exchanger tank in accordance with a second embodiment of the present invention;
Fig. 6 is a cross-sectional view showing a heat exchanger tank in accordance with a third embodiment of the present invention;
Fig. 7 is a perspective view showing the heat exchanger tank shown in Fig. 6;
Fig. 8 is a cross-sectional view showing the structure of mounting the heat exchanger tank shown in Fig. 6 to the vehicle body;
Fig. 9 is a perspective view showing a conventional heat exchanger;
Fig. 10 is a perspective view showing a conventional heat exchanger tank; and
Fig. 11 is a cross-sectional view showing the structure of mounting the conventional heat exchanger tank to the vehicle body.

Figs. 1 and 2 show a heat exchanger tank in accordance with a first embodiment of the present invention. In the present embodiment, the present invention is applied to a radiator tank.

In the present embodiment, a tank body 11 is cylindrically formed so as to have a rectangular cross section.

As shown in Fig. 3, the tank body 11 is formed by sequentially rolling a plate material 12.

In the present embodiment, aluminum clad material is used for the plate material 12. The surface of the plate material 12 which will be an exterior surface of the tank body 11 is covered with a brazing filler metal layer R, and the surface of the plate material 12 which will be an interior surface of the tank body 11 is covered with a sacrifice corrosion layer G used for surface corrosion.

One end 11a of the plate material 12 extends along the other end 11b of the tank body 11, and this extended portion is brazed to the end 11b.

As shown in Fig. 2, tube holes 11c are formed at intervals in one surface of the tank body 11 in a longitudinal direction.

The tank body 11 corresponds to the upper tank 10 of the radiator which will be described later. A mount hole 19a used for receiving a filler neck 19 is formed in the surface opposite to the surface in which the tube holes 11c are formed, and the filler neck 19 is brazed to the mount hole 19a.

A mount hole 17a for receiving an inlet pipe 17 is formed in the surface opposite to the surface to which the end 11a is brazed, and the inlet pipe 17 is brazed to the mount hole 17a.

An end plate 13 made of aluminum is fitted and brazed to each side of the tank body 11.

As shown in Fig. 4, for example, the foregoing heat exchanger tank is attached to each side of a core 16 of the radiator.

The core 16 is formed by stacking tubes 14 each having a brazing filler metal layer on an outer surface thereof and corrugated fins 15, and reinforces 18 are attached to both sides of the core 16.

An upper tank body 11 is formed by folding the plate material 12, and by forming, in one surface of the tank body 11, the tube holes 11c, the mount hole 19a used for receiving the filler neck 19, and the mount hold 17a used for receiving the inlet pipe 17. Further, the filler neck 19, the inlet pipe 17, outer surface of which is to be clad with a brazing filler metal layer, and the end plates 13 are temporarily attached to the tank body 11 in which the end 11a of the tank body is temporarily superimposed on the end 11b. Such an upper tank body 11 is attached to the upper side of the core 16, and the tubes 14 are fitted into the tube holes 11c of the tank body 11.

A lower tank body 11 is formed by folding the plate material 12, and by forming, in one surface of the tank body 11, the tube holes 11c, and the mount hold 17a used for receiving an outlet pipe 17A. Further, the outlet pipe 17A, the outer surface of which is to be clad with a brazing filler metal layer, and the end plates 13 are temporarily attached to the tank body 11 in which the end 11a of the tank body is temporarily superimposed on the end IIb. Such a lower tank body 11 is attached to the lower side of the core 16, and the tubes 14 are fitted into the tube holes 11c of the tank body 11.

Noncorrosive flux is applied to the thus-temporarily assembled radiator and is subjected to heat treatment in a brazing furnace, whereby the components of the radiator are integrally brazed together.

More specifically, the tubes 14 are brazed to the tube holes 11c by means of the fused brazing filler metal layer R of the tank body 11 and the brazing material of the tube 14. Further, the ends 11a, 11b of the tank body 11 are brazed together, and additional components are also brazed to the tank body 11.

In the heat exchanger tank having the foregoing configuration, the cylindrical tank body 11 is formed by folding the plate material 12 which has a brazing filler metal layer R and is formed from aluminum clad. The end 11a of the plate material 12 is extended along the end 11b of the tank body 11, and the thus-extended portion is brazed to the end 11b. As a result, the brazing filler metal layer R can be readily and thoroughly formed over the tank body 11.

Accordingly, in comparison with a case where the tank body is formed by extrusion of aluminum, there is eliminated the need for ensuring brazing material by use of additional plate material which is formed from aluminum clad with a brazing filler metal layer. Therefore, the ends of the tubes 14 can be readily and reliably brazed to the tube holes 11c of the tank body 11.

In the foregoing heat exchanger tank, the mount hole 17a for receiving the inlet pipe 17 or the outlet pipe 17A is formed in the surface of the tank body 11 opposite to the surface to which the end 11a is brazed. The height of the tank body 11 can be set to a dimension similar to the diameter of the inlet pipe 17 or the outlet pipe 17A. Further, although it is difficult to form the mount hole 17a over the overlapped portion of the ends 11a and 11b, such a complicated step can be omitted in this embodiment.

In the aforementioned embodiment, the tank body is formed so as to have a rectangular cross section. However, the cross-section shape is not limited to the rectangular, and technical idea of the present invention can be applied to the other type tank body which has a circular cross section or other shapes.

Fig. 5 shows a heat exchanger tank in accordance with a second embodiment of the present invention. In the present embodiment, one end 20b overlaps the other end 20c along an angular portion 20a of a tank body 20 having a rectangular cross section. The ends 20b and 20c of a plate material 12A are brazed to each other in the vicinity of the angular portion 20a.

Even in the heat exchanger tank in accordance with the second embodiment, an advantageous result similar to that obtained in the first embodiment can be ensured. In the second embodiment, the end 20b overlaps the end 20c of the plate material 20A along the angular portion 20a of the tank body 20. The thus-overlapping ends are brazed together. As a result, the strength of the angular portion 20a on which stress concentrates can be increased. The risk of fractures in the angular portion 20a can be reduced.

Figs. 6 and 7 show a heat exchanger tank in accordance with a third embodiment of the present invention. In the drawings, reference numeral 21 designates a tank body of a radiator.

The tank 21 is formed so as to have a rectangular cross-section by folding a plate material 23 by means of rolling operation as described in the first embodiment.

A body 25a of a mount bracket 25 is brazed to a mount surface 21a of the tank body 21.

A leg 25b integrally formed with the mount bracket 25 is brazed to a surface (hereinafter referred to as an adjacent surface) 21b adjacent to the mount surface 21a of the tank body 21.

A through hole 25c is formed in the mount bracket 25 so as to permit receipt of a projection 27a of a pin member 27.

The pin member 27 is brazed to the mount bracket 25 and comprises a protuberance 27b which protrudes upward.

In the present embodiment, the end of the plate material 23 forming the tank body 21 extends along the exterior of the adjacent surface 21b of the tank body 21, to thereby constitute an extended portion 21c.

The extended portion 21c is sandwiched between the body 25a and the leg 25b of the mount bracket 25.

The body 25a of the mount bracket 25 extends along a surface 21d opposite to the adjacent surface 21b of the tank body 21, to thereby constitute a folded portion 25d.

As shown in Fig. 7, the leg 25b of the mount bracket 25 is integrally formed with the front ends of vertical portions 25e which are made by folding, at right angles, both sides of the area around the protuberance 27b of the mount bracket 25.

In the present embodiment, the plate material 23 constituting the tank body 21 is formed from aluminum clad material, and the side of the plate material 23 which will be the outer peripheral surface of the tank body 21 is coated with a brazing filler metal layer.

The plate material forming the mount bracket 25 is formed from aluminum clad material, and the side of the plate material which will be the outer peripheral surface of the mount bracket 25 is coated with a brazing filler metal layer.

In Fig. 6, the end of a tube 31 forming a core 29 is fitted into a surface 21e opposite to the mount surface 21a of the tank body 21.

Fig. 8 shows the principal elements of the structure for mounting the foregoing heat exchanger tank to the vehicle body. The protuberance 27b of the mount bracket 25 is inserted into and supported by a through hole 35a formed in one side of a vehicle mount bracket 35 via a mount rubber 33.

The other end of the vehicle mount bracket 35 is fixed to an upper rail 39 of the vehicle through use of a bolt 37.

In the foregoing heat exchanger tank, the mount bracket 25 is pressed by the mount surface 21a of the tank body 21, whereby the extended portion 21c of the tank body 21 is sandwiched between the body 25a and the leg 25b of the mount bracket 25. As a result, the body 25a and the leg 25b of the mount bracket 25 are held in position, so that the mount bracket 25 is temporarily fixed to the tank body 21.

In this state, the tank and the bracket are housed in a brazing furnace, and the radiator is integrally brazed to the bracket. More specifically, the body 25a of the

mount bracket 25 is brazed to the mount surface 21a of the tank body 21, and the leg 25b is brazed to the adjacent surface 21b.

In the heat exchanger tank having the foregoing configuration, the end of the plate material 23 which forms the tank body 21 having a rectangular cross section extends along the exterior surface of the surface 21b adjacent to the mount surface 21a of the tank body 21. The extended portion 21c is sandwiched between the main body 25a and the leg 25b of the mount bracket 25, to thereby temporarily fix the mount bracket 25 to the tank body 21. As a result, the mount bracket 25 can be temporarily fixed to the tank body 21 in a ready and reliable manner.

Further, in the foregoing heat exchanger tank, the body 25a and the leg 25b of the mount bracket 25 are brazed to the tank body 21 through use of a brazing filler metal layer, and therefore the mount bracket 25 can be readily and reliably brazed to the tank body 21.

Although the foregoing embodiments have been described with reference to a case where the present invention is applied to the tank of the radiator, the present invention is not limited to this embodiment. For example, the present invention can also be applied to the heat exchanger tank such as a condenser for an air conditioning system.

Although aluminum clad material, one side of which forms the exterior surface of the bracket and is covered with a brazing filler metal layer is used for the plate material forming the mount bracket in the foregoing embodiments, the present invention is not limited to this embodiment. Simple aluminum plate material may be employed as the plate material for forming the mount bracket.

As has been described above, in a heat exchanger tank according to the present invention, a cylindrical tank body is formed by folding a plate material which has a brazing filler metal layer and is formed from aluminum clad. One end of the plate material is extended along the other end of the tank body, and the thus-extended portion is brazed to the end. As a result, the brazing filler metal layer can be readily and thoroughly formed over the tank body.

One end can overlap the other end along an angular portion of a tank body having a rectangular cross section and the ends are brazed to each other, thereby enabling an increase in the strength of the angular portion on which stress concentrates.

When a mount hole for receiving an inlet pipe or an outlet pipe is formed in the surface of the tank body opposite to the surface to which one end is brazed, the height of the tank body can be set to a dimension similar to the diameter of the inlet pipe or the outlet pipe.

Further, in an embodiment of a heat exchanger tank according to the present invention, the end of the plate material extends along the exterior of the surface adjacent to the mount surface of the tank body to which the body of the mount bracket is mounted. The thus-extended end of the plate material is sandwiched between the main body and the leg of the mount bracket, whereby the mount bracket is temporarily mounted to the tank body in a ready and reliable manner.

The body and the leg of the mount bracket may be brazed to the tank body by means of a brazing filler metal layer forming a tank body. As a result, the mount bracket can be readily and reliably brazed to the tank body.

Claims

1. A heat exchanger tank comprising:
   a hollow tank body portion (11, 20, 21) formed by folding a plate made of aluminium clad material having a brazing filler metal layer (R), and wherein a first end (11a, 20b, 21c) of the plate material extends along and is brazed to a second end (11b, 20c, 21b) of the plate material.

2. A heat exchanger tank according to claim 1, wherein an outer surface of the tank body portion (11, 20, 21) is clad with the brazing filler metal layer (R).

3. A heat exchanger tank according to claim 1 or 2, wherein an internal surface of the tank portion (11, 20, 21) is clad with a sacrificial layer (G).

4. A heat exchanger tank according to any one of the preceding claims, wherein the tank body portion (11, 20, 21) is formed so as to have a rectangular cross section.

5. A heat exchanger tank according to claim 4, wherein the first end (20c) and the second end (20b) of the plate material are overlapped and brazed to each other along an angular portion of the rectangular cross section.

6. A heat exchanger tank according to any one of the preceding claims, wherein a hole (17a) used for mounting an inlet or outlet pipe (17) to the heat exchanger is formed in a surface opposite to a surface in which the first end (11a, 20b, 21c) of the plate material is brazed.

7. A heat exchanger tank according to any one of the preceding claims,

   also including a mount bracket (25) including a main body (25a) brazed to a mount surface (21a) of the tank portion (11, 20, 21) and a leg (25b) brazed to a surface (21b) adjacent the mounting surface (21a);
   wherein overlapped first and second ends (11a, 20b, 21c; 11b, 20c, 21b) are sandwiched between the main body (25a) and the leg (25b) of

the mount bracket (25).

8. A heat exchanger tank comprising:

a tank body (11, 20b, 21c) formed by folding a plate material so as to have a rectangular cross section, a first end of the plate material (11a, 20b, 21c) extending along an outer side of an adjacent surface of the tank body; and
a mount bracket (25) including a main body (25a) brazed to a mount surface (21a) of adjacent to the adjacent surface of the tank body and a leg (25b) brazed to the adjacent surface;
wherein the first end extended along the outer side of the adjacent suface is sandwiched between the main body (25a) and the leg (24b) of the mount bracket (25).

9. A heat exchanger tank according to claim 8, wherein the plate material comprising aluminium clad material, and a side of the plate material which serves an outer peripheral surface of the tank body is coated with a brazing filler metal layer (R).

FIG. 1

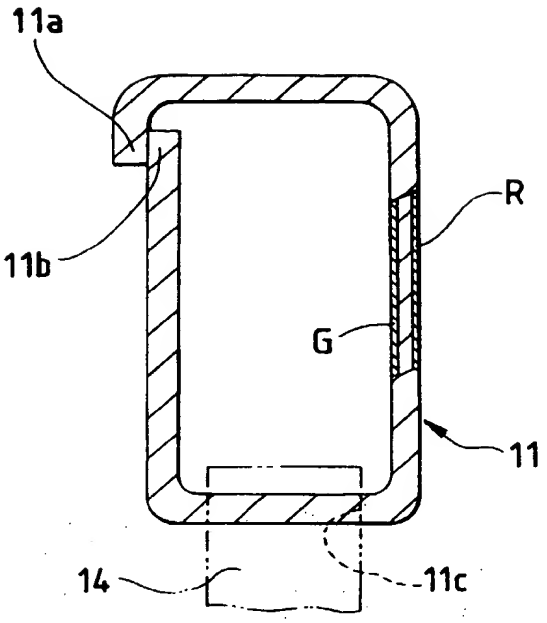


FIG. 2

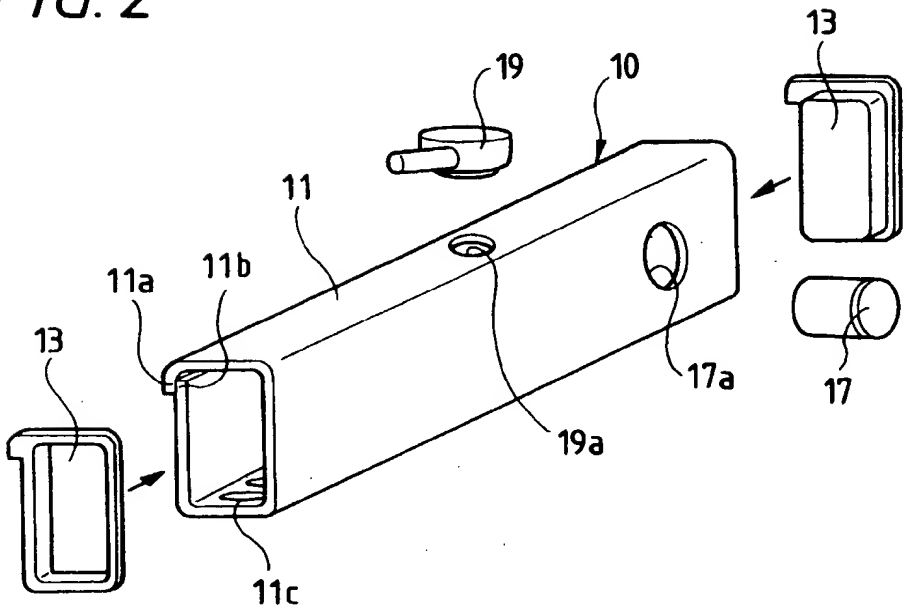


FIG.3

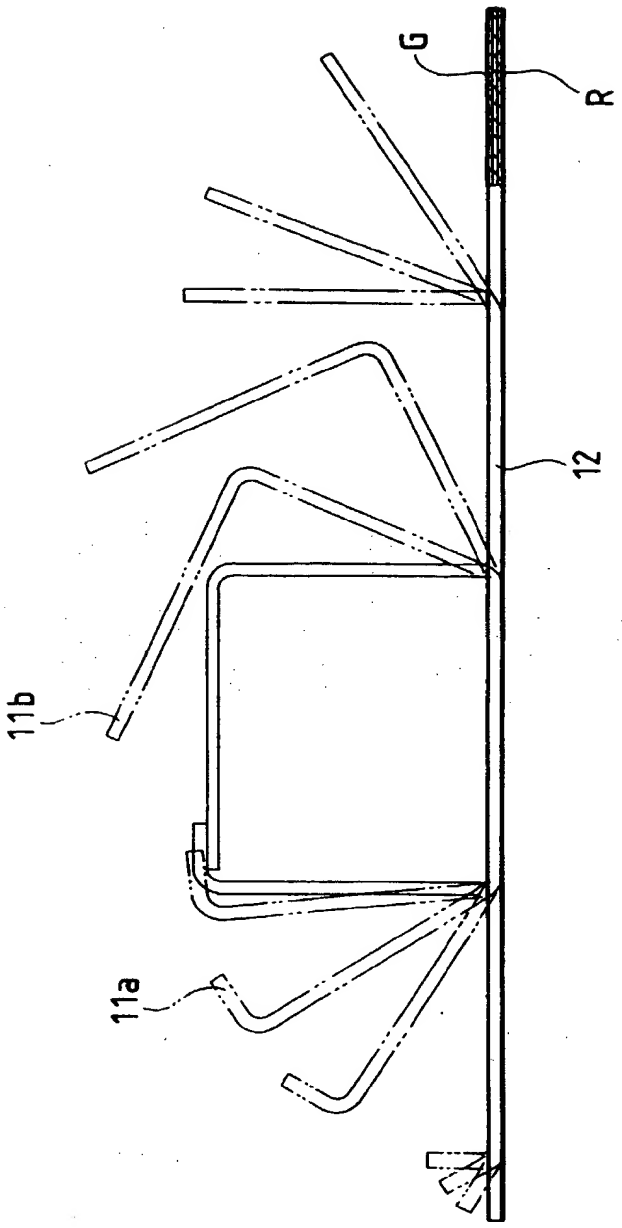


FIG. 4

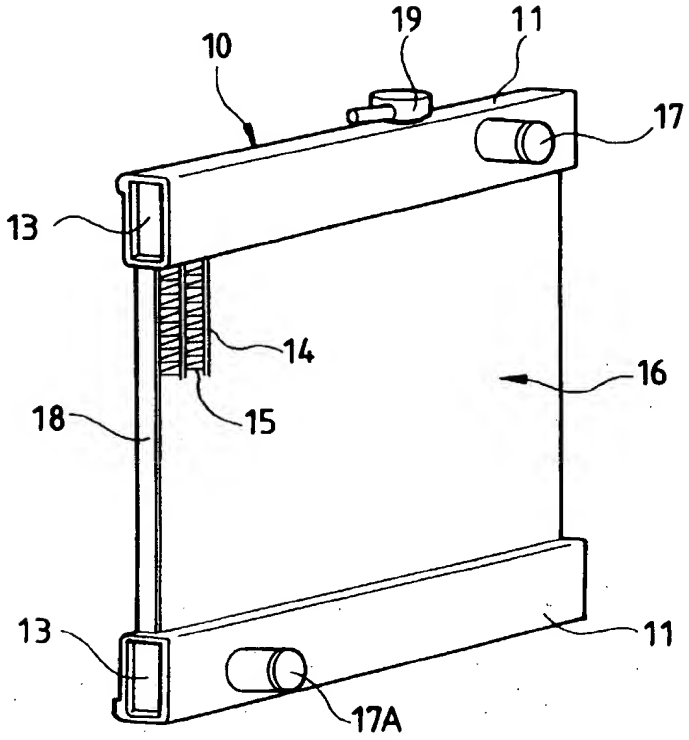


FIG. 5

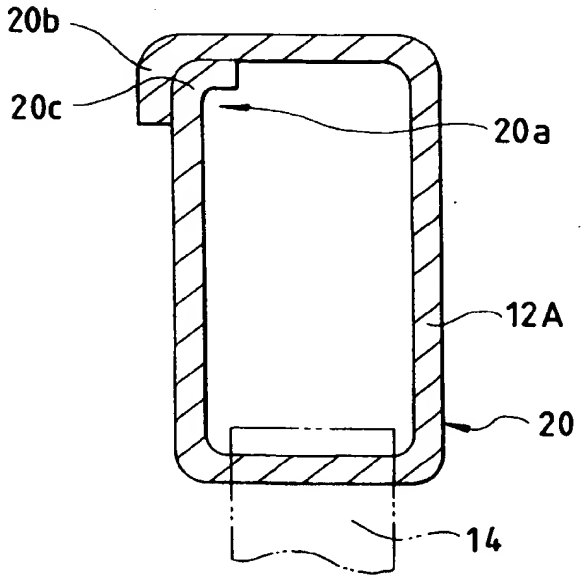


FIG. 6

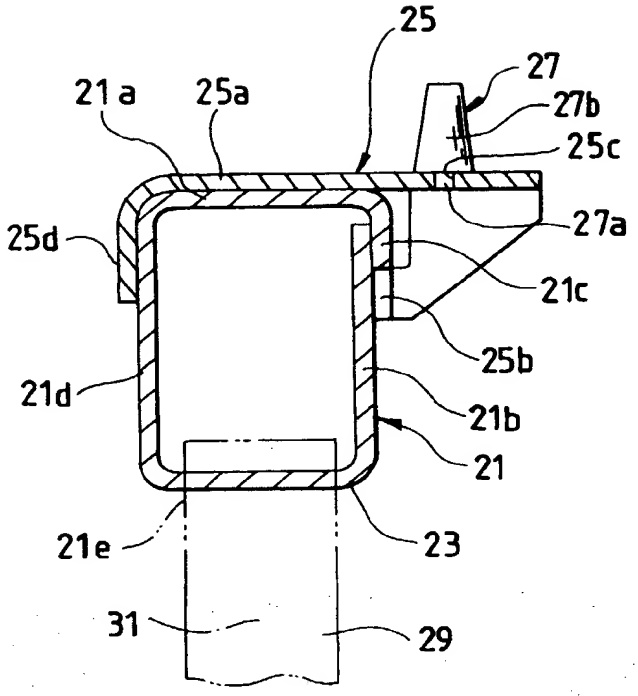


FIG. 7

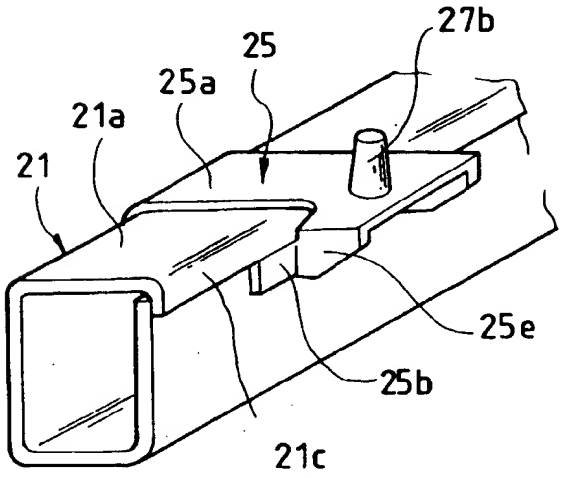


FIG. 8

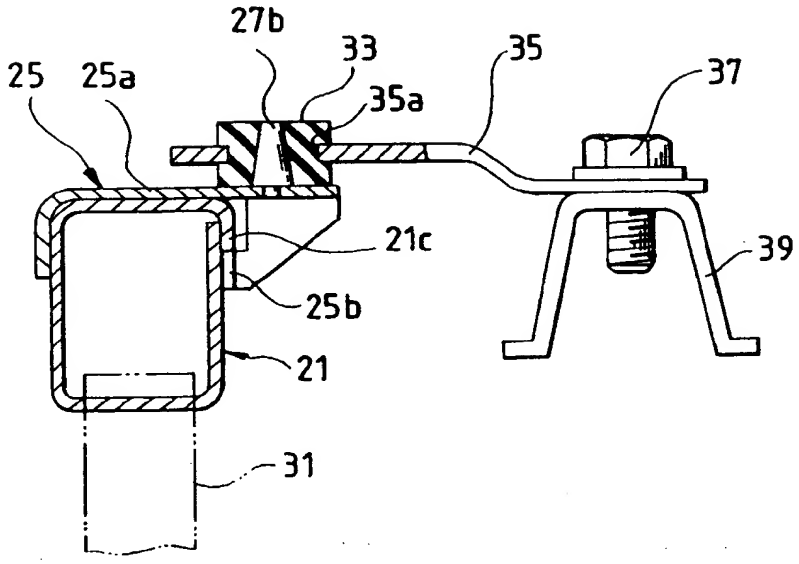


FIG. 9

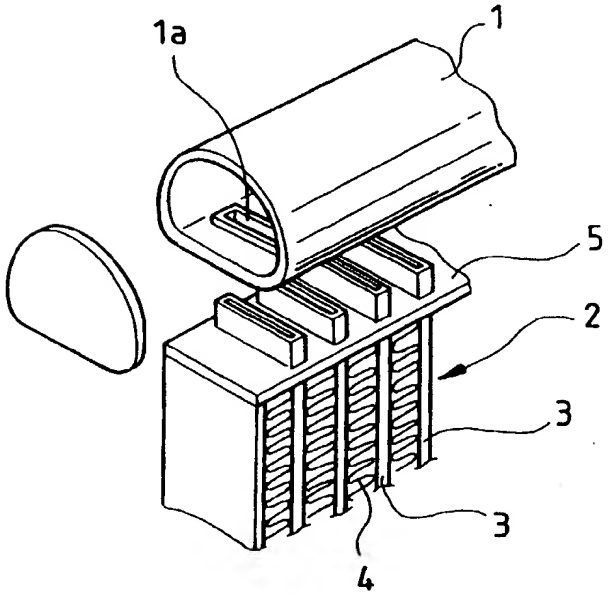


FIG. 10

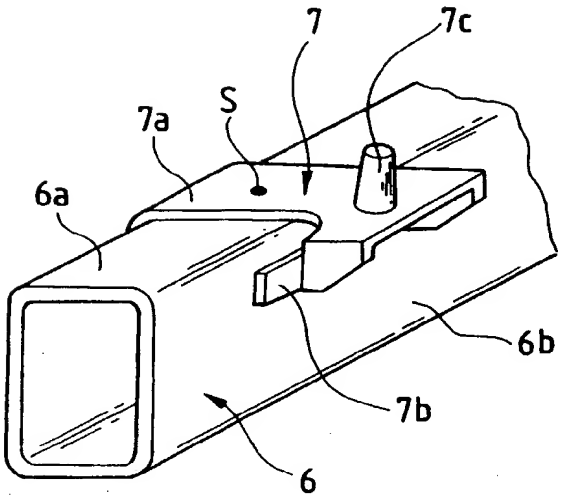


FIG. 11

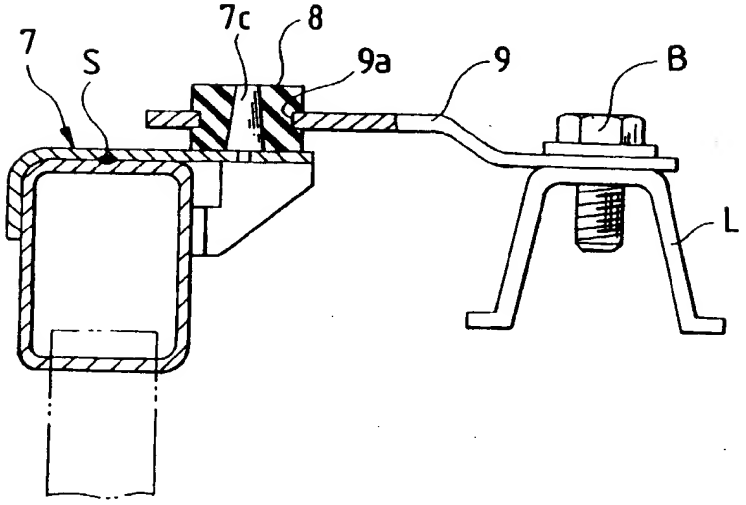


FIG. 1

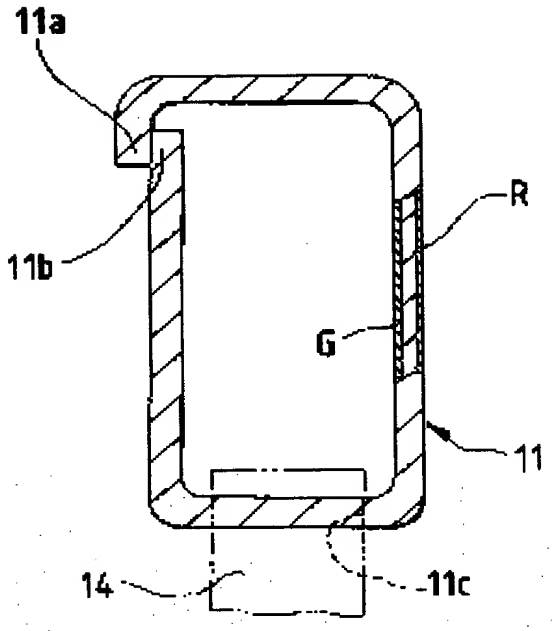


FIG. 2

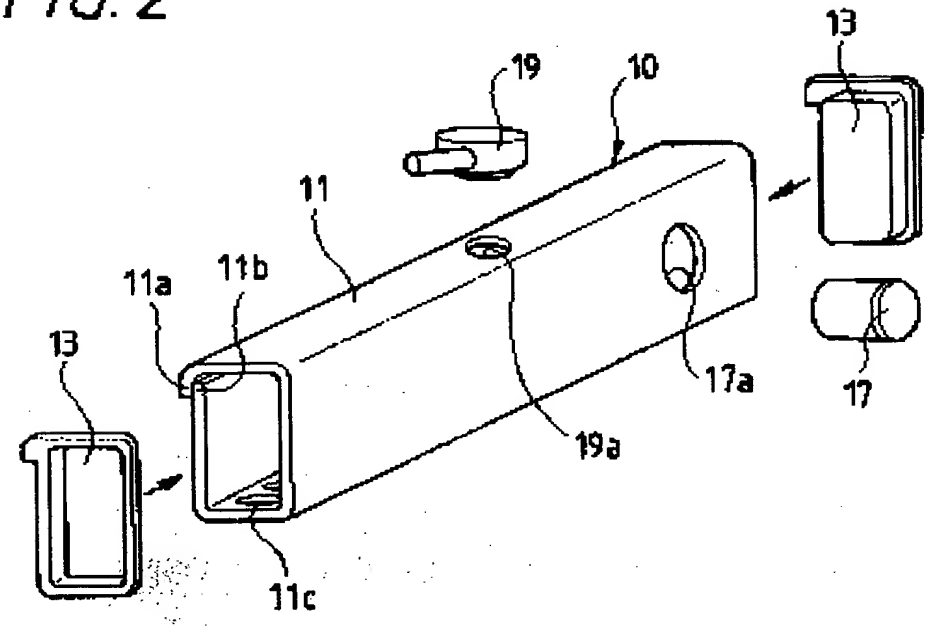


FIG.3

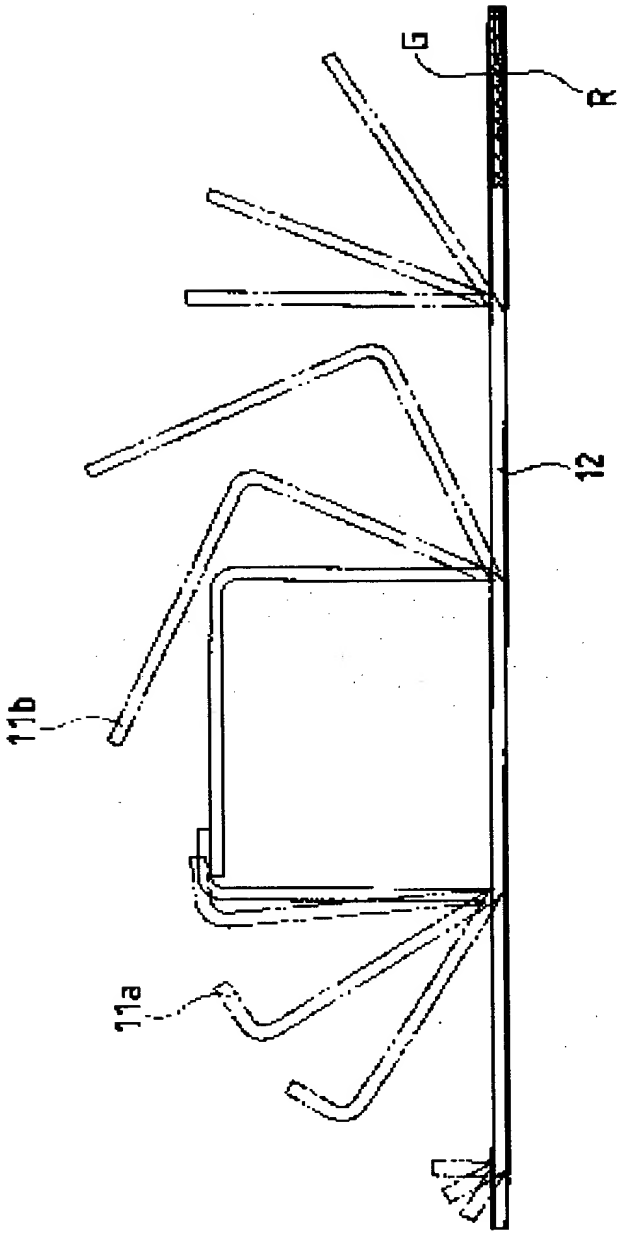


FIG. 4

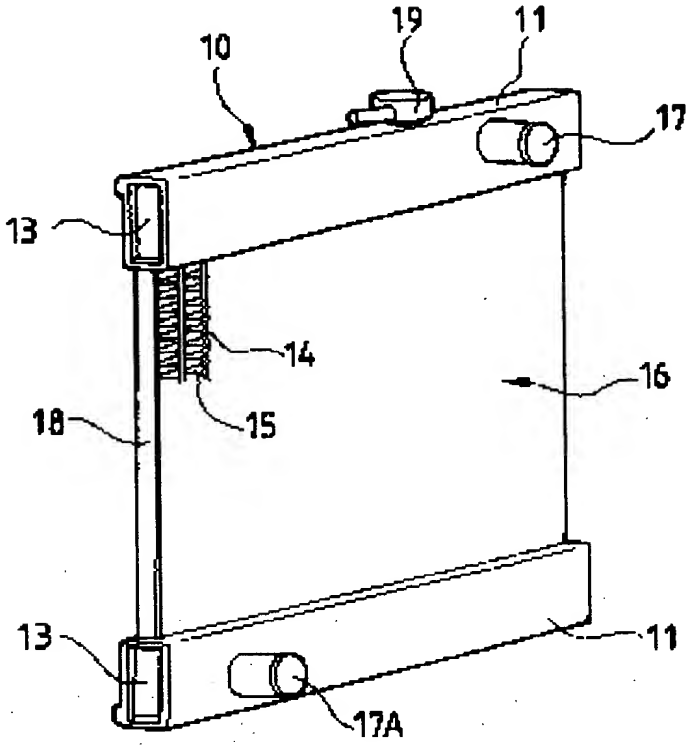


FIG. 5

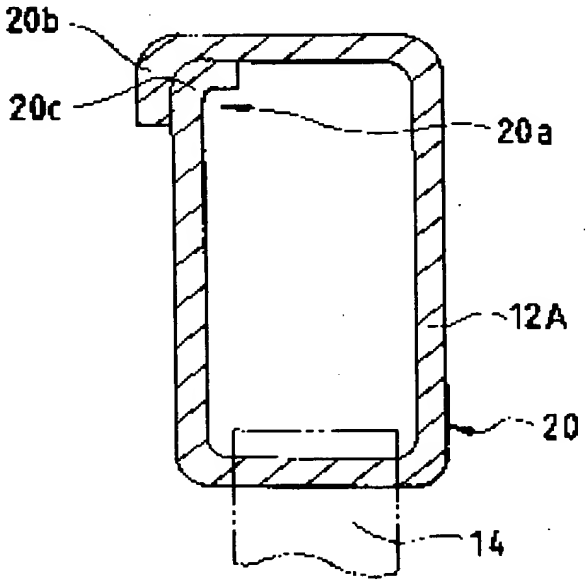


FIG. 6

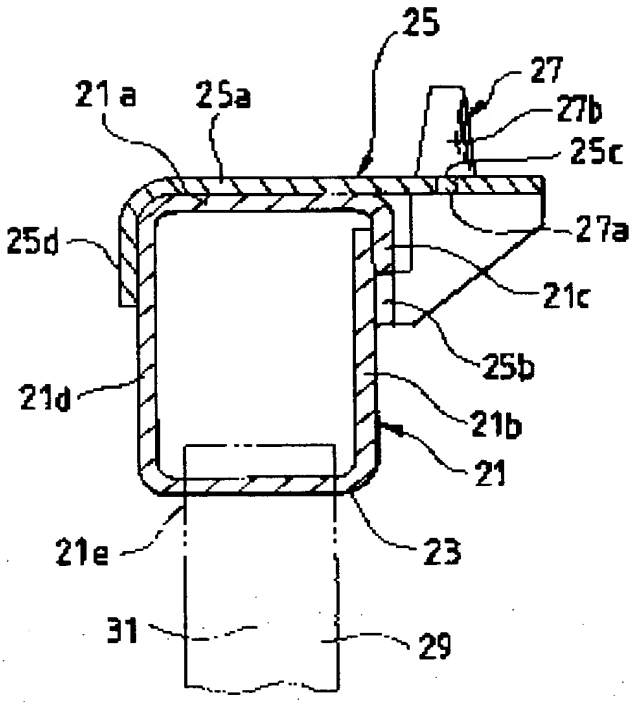


FIG. 7

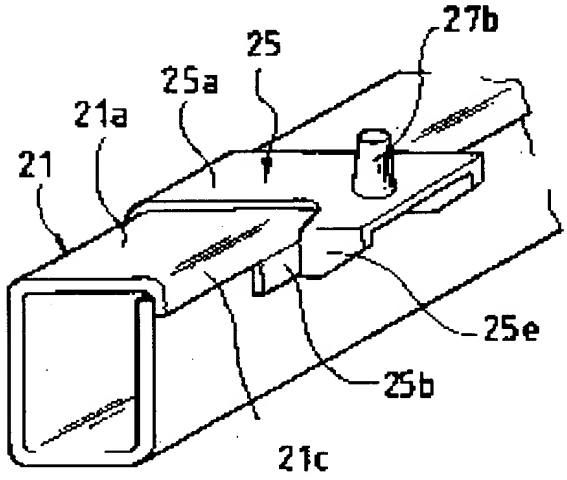


FIG. 8

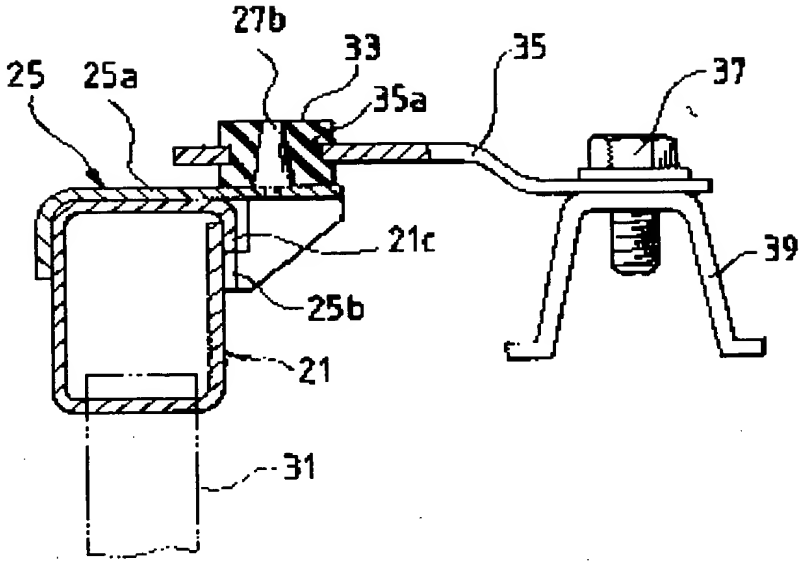


FIG. 9

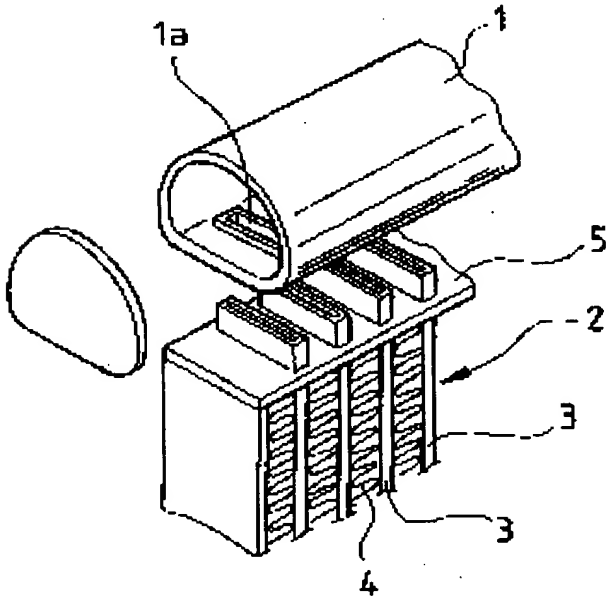


FIG. 10

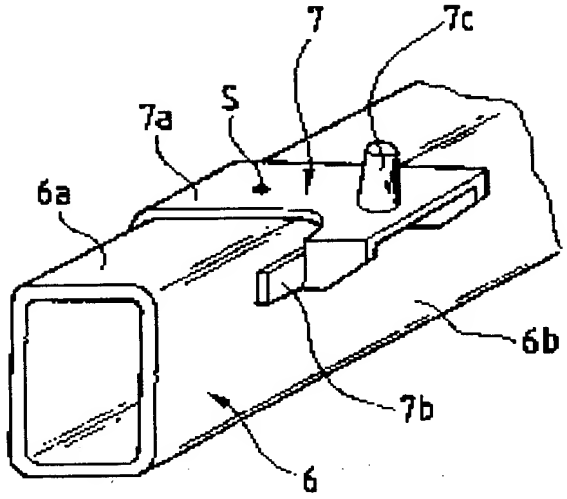
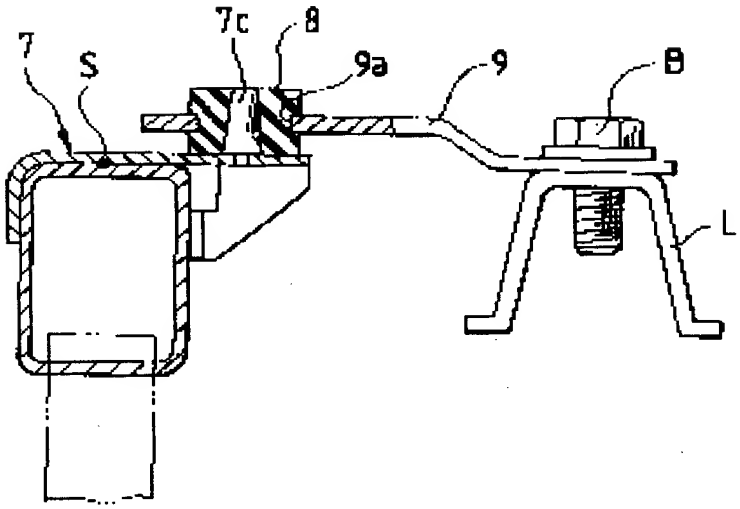


FIG. 11



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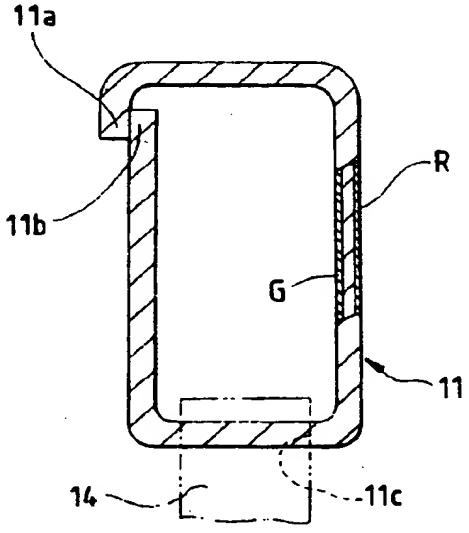
(54) Heat exchanger tank

(57) A hollow tank body portion (11) is formed by folding a plate of aluminium clad with a brazing filler metal layer (R). One end of the plate material (11a) extends over the other end (11b) and the thus overlapped ends (11a, 11b) are brazed together. Preferably these overlapped portions (11a, 11b) provide a locating portion for a mounting bracket (25 Fig 6) to hold it in place as it is brazed.

FIG. 1



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Application Number
EP 97 30 9256

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US 5 172 762 A (SHINMURA TOSHIHARU ET AL) 22 December 1992 * column 5, line 60 - column 6, line 18; figures 7,8 *	1,2,4 3	F28F9/02 F28F9/00
Y	EP 0 637 481 A (FURUKAWA ELECTRIC CO LTD) 8 February 1995 * page 4, line 9 - line 14; figure 1 *	3	
X	US 5 429 182 A (HANAFUSA TATSUYA) 4 July 1995 * column 5, line 34 - line 38 * * column 7, line 62 - line 66 * * column 9, line 42 - line 49; figures 8-10 *	1,2,7-9	
P,X A	EP 0 760 457 A (GEN MOTORS CORP) 5 March 1997 * column 3, line 6 - line 36; figures 4,5 *	1,2 7-9	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 October 1998	Mootz, F

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